

User Guide

RM024 DVK

Version 2.0

Revision History

Version	Date	Change Description	Contributors	Approved By
1.0	20 Dec 2012	Initial Release		Chris Downey
1.1	15 Apr 2014	Added RM024 DVK PCB Layout and Hardware Schematic .		Chris Downey
1.2	29 Apr 2014	Updated Jumper Set J9 to reflect Disable Drivers and Normal Operation variants.		Chris Downey
2.0	22 Apr 2025	Ezurio rebranding	Sue White	Dave Drogowski

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1 Overview

This document contains information about the hardware included as part of the Ezurio OEM RM024 family Developer Kit (DVK).

The RM024 DVK is designed to allow flexibility at the hardware interface level so that the RM024 DVK can be easily interfaced to the OEM product, to a PC for performance testing, or to any other device that supports RS232 or USB serial interfaces.

The RM024 DVK is a complete, integrated package that contains all of the hardware, software, and documentation needed to integrate an OEM transceiver quickly and effortlessly.

There are many Development Kits to choose from based on your needs; the complete list is in Table 1.

Table 1: RM024 Development Kits

Part Number	Description
DVK-RM024-S125-C	(2) RM024 SMT 125mW transceivers w/U.FL connector (1) RS232 serial adapter board (1) USB serial adapter board (1) DB9 (F) to DB9 (F) RS232 cable (1) USB cable 6 ft. (2) 2.4GHz 1/2 dipole antennas Ezurio Reference Card
DVK-RM024-S125-M	(2) RM024 SMT 125mW transceivers w/integrated antenna (1) RS232 serial adapter board (1) USB serial adapter board (1) DB9 (F) to DB9 (F) RS232 cable (1) USB cable 6 ft. Ezurio Reference Card
DVK-RM024-S50-C	(2) RM024 SMT 50mW transceivers w/U.FL connector (1) RS232 serial adapter board (1) USB serial adapter board (1) DB9 (F) to DB9 (F) RS232 cable (1) USB cable 6 ft. (2) 2.4GHz 1/2 dipole antennas Ezurio Reference Card
DVK-RM024-S50-M	(2) RM024 SMT 50mW transceivers w/integrated antenna (1) RS232 serial adapter board (1) USB serial adapter board (1) DB9 (F) to DB9 (F) RS232 cable (1) USB cable 6 ft. Ezurio Reference Card
DVK-RM024-P125-C	(2) RM024 Pluggable 125mW transceivers w/U.FL connector (1) RS232 serial adapter board (1) USB serial adapter board (1) DB9 (F) to DB9 (F) RS232 cable (1) USB cable 6 ft. (2) 2.4GHz 1/2 dipole antennas Ezurio Reference Card
DVK-RM024-P125-M	(2) RM024 Pluggable 125mW transceivers w/integrated antenna (1) RS232 serial adapter board (1) USB serial adapter board

Part Number	Description
	(1) DB9 (F) to DB9 (F) RS232 cable (1) USB cable 6 ft. Ezurio Reference Card
DVK-RM024-P50-C	(2) RM024 Pluggable 50mW transceivers w/U.FL connector (1) RS232 serial adapter board (1) USB serial adapter board (1) DB9 (F) to DB9 (F) RS232 cable (1) USB cable 6 ft. (2) 2.4GHz 1/2 dipole antennas Ezurio Reference Card
DVK-RM024-P50-M	(2) RM024 Pluggable 50mW transceivers w/integrated antenna (1) RS232 serial adapter board (1) USB serial adapter board (1) DB9 (F) to DB9 (F) RS232 cable (1) USB cable 6 ft. Ezurio Reference Card

2 Hardware

The RM024 DVK board is provided so the developer can use a standard PC interface to operate the transceivers and to aid in system integration. It uses an RS232 or USB data format to interface to the transceiver. This document provides a **Hardware Schematic** for the RM024 Development Board.

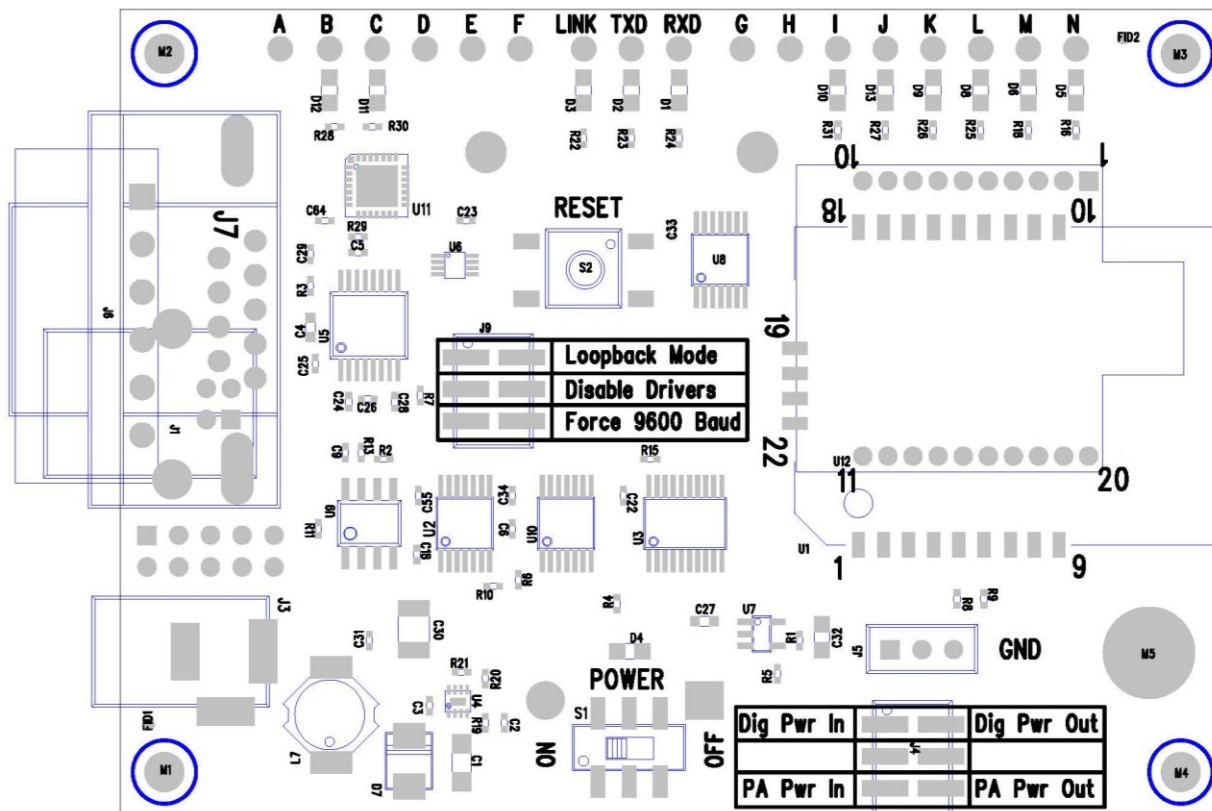


Figure 1: RM024 DVK PCB Layout

The RM024 Development Board may be ordered with either a USB or DB9 interface to the PC. **Figure 2** and **Figure 3** illustrate the two connector variants.

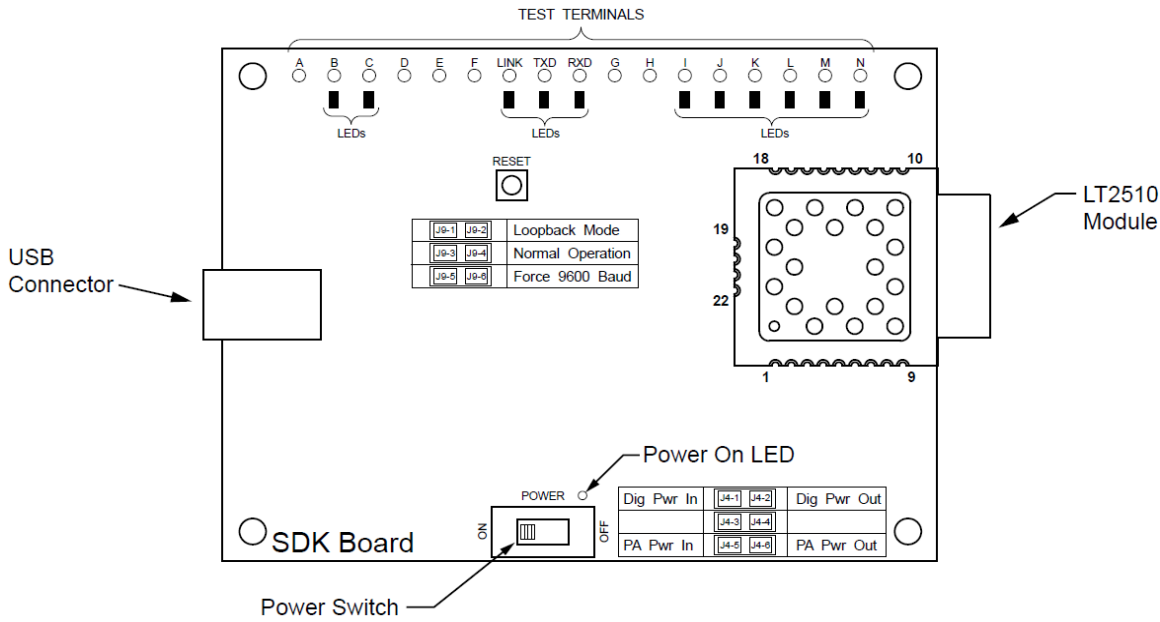


Figure 2: DVK Board with USB Connector

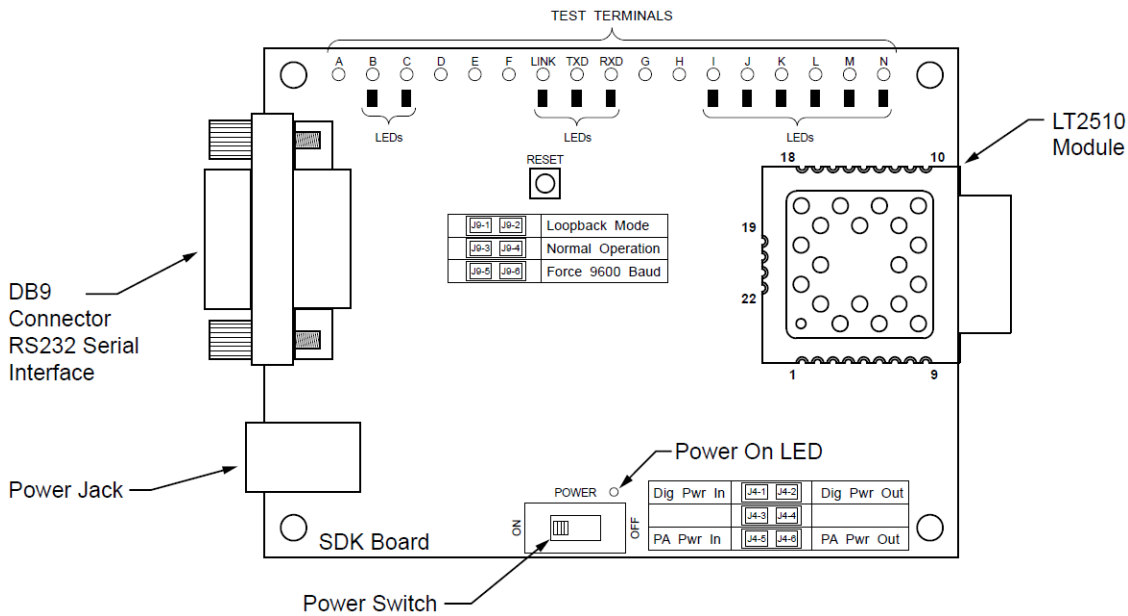


Figure 3: DVK Board with DB9 Connector

The LEDs located on the front edge of the board continuously show the configuration and operation of the RM024 DVK board. Refer to Table 2 for definitions of the LEDs, and Table 3 for DB9 connector pin assignments.

Table 2: RM024 DVK LEDs

LED	LED Color	Purpose
B	Green	This LED illuminates when GIO_6 is low.
C	Red	This LED illuminates when GIO_4 is low.
I	Green	This LED illuminates when 9600_BAUD is high.
J	Red	This LED illuminates when GIO_7 is low.
K	Red	This LED illuminates when GIO_3 is low.
L	Green	This LED illuminates when GIO_2 is low.

LED	LED Color	Purpose
M	Red	This LED illuminates when GIO_1 is low.
N	Green	This LED illuminates when GIO_0 is low.
LINK	Red	This LED illuminates when In_Range is high.
TXD	Green	This LED illuminates when TXD is low.
RXD	Red	This LED illuminates when RXD is low.
Power	Green	This LED illuminates when the POWER switch is turned on and the module is powered.

Table 3: DB9 Pins

DB9 Pin	Signal Name	Description	Direction
1	DCD	Data Carrier Detect	I
2	RXD	Received Data	I
3	TXD	Transmitted Data	O
4	DTR	Data Terminal Ready	O
5	GND	Signal Ground	
6	DSR	Data Set Ready	I
7	RTS	Request to Send	O
8	CTS	Clear to Send	I
9	RI	Ring Indicator	I

Note: I/O direction is relative to the PC.

2.1 Power Switch

The RM024 DVK board is equipped with a power switch. Use this switch to turn the power to the board on and off. This power switch should be turned OFF when the USB or power supply cable is connected or disconnected to prevent possible damage to the board.

Switch	Description
Power	When set to the OFF position, power is removed from the DVK board and the RM024 transceiver.

2.2 Jumper Usage

The RM024 DVK board utilizes a set of jumpers to accomplish certain tasks. There are two sets of jumpers, the **J4** set and the **J9** set.

2.2.1 Jumper Set J4

Use the J4 set of jumpers to complete the circuits that supply power to the radio. There are two jumpers and BOTH JUMPERS MUST BE PROPERLY INSTALLED for the module to operate. A jumper MUST be installed on J4-1 and J4-2 to supply power to the radio itself. Another jumper MUST also be installed on J4-5 and J4-6 to supply power to the power amplifier.

2.2.2 Jumper Set J9

Use the J9 set of jumpers to control how the development kit board operates. Only one jumper is used with this jumper set. There are three operational modes:

- **Loopback** – Install the jumper on pins J9-1 and J9-2 to operate the unit in loopback mode. This means that the radio receives data and then transmits the same data. The loop is on the serial interface of the module and points back to the radio. This jumper is useful for range testing.
- **Normal Operation OR Disable Drivers** – On older revisions of the DVK board, J9 pins 3 and 4 are labeled Normal Operation. In newer revisions, these pins are labeled Disable Drivers and have different functionality. These are detailed below:
 - **Normal Operation:** Install the jumper on pins J9-3 and J9-4, to operate the unit in its normal mode. This means that the radio operates however it is configured using the DVK software application.

- **Disable Drivers:** When these pins are bridged, the DVK board disables the drivers for the RX and RTS input pins to the module. By disabling the RS232 or USB driver, you can connect directly to the embedded microprocessor.

Note: If you disable drivers and connect directly to your microprocessor using the TXD and RXD through-hole connections on the evaluation board, you CANNOT simultaneously “sniff” the communications through the board’s DB9 or USB connector. This will cause the communications to be unreliable or completely non-functional.

- **Force 9600 Baud** – Install the jumper on pins J9-5 and J9-6 to operate the unit only at 9600 Baud. This is a recovery mode that is used when the user is unable to communicate with the radio. This mode places the unit in a known operating state so the user can go in and access the programmed data via the development software.

Table 4: J4 and J9 Jumper Pins

Jumper ID	Label	Usage
J4-1	Dig Pwr In	A jumper MUST be connected to these two pins for operation. This is the power supply circuit for the radio.
J4-2	Dig Pwr Out	
J4-3	Not Used	Not Used
J4-4	Not Used	Not Used
J4-5	PA Pwr In	A jumper MUST be connected to these two pins for operation. This is the power supply circuit for the power amplifier.
J4-6	PA Pwr Out	
J9-1	Loopback	To configure the radio for loopback operation, connect a jumper to these two pins.
J9-2	Loopback	Note: You MAY NOT connect a jumper to the Normal Operation or Force 9600 Baud pins at the same time.
J9-3	Normal Operation OR Disable Drivers	Depending on board variant, either connect for normal operation or to disable the board drivers and interface directly with the microprocessor. See Jumper Set J9 for details.
J9-4	Normal Operation OR Disable Drivers	Note: You MAY NOT connect to the Loopback or Force 9600 Baud pins at the same time.
J9-5	Force 9600 Baud	To force the radio to operate at 9600 Baud, connect a jumper to these two pins.
J9-6	Force 9600 Baud	Note: You MAY NOT connect to the Loopback or Normal Operation pins at the same time.

2.3 Interfacing the RM024 DVK to other RS232 hardware

The development kit serial board is a DCE (Data Communications Equipment) device. A DCE device is wired to the interface directly with a DTE (Data Terminal Equipment) device. Typically, a DTE device is a PC, while a DCE device is a peripheral. To interface a DCE device to other DCE device, or a DTE device to another DTE device, a null modem is required. The null modem simply swaps pins to convert a DCE device to a DTE device, and vice-versa. Normally, a null modem consists of a female and a male DB9 connector. A typical null modem configuration is shown in Table 5.

Table 5: Interfacing over RS232 - Hardware Configurations

DB9 Pin	Signal Name	DCE Direction	DTE Pin	Signal Name	DTE Direction	Null Modem Female DB9
1	DCD	O	1	I	1	4 or NC
2	RXD	O	2	I	2	3
3	TXD	I	3	O	3	2
4	DTR	I	4	O	4	6 & 1 or NC
5	GND	5	GND	5		
6	DSR	O	6	I	6	4 or NC
7	RTS	I	7	O	7	8
8	CTS	O	8	I	8	7
9	RI	O	9	I	9	NC

2.4 Hardware Schematic

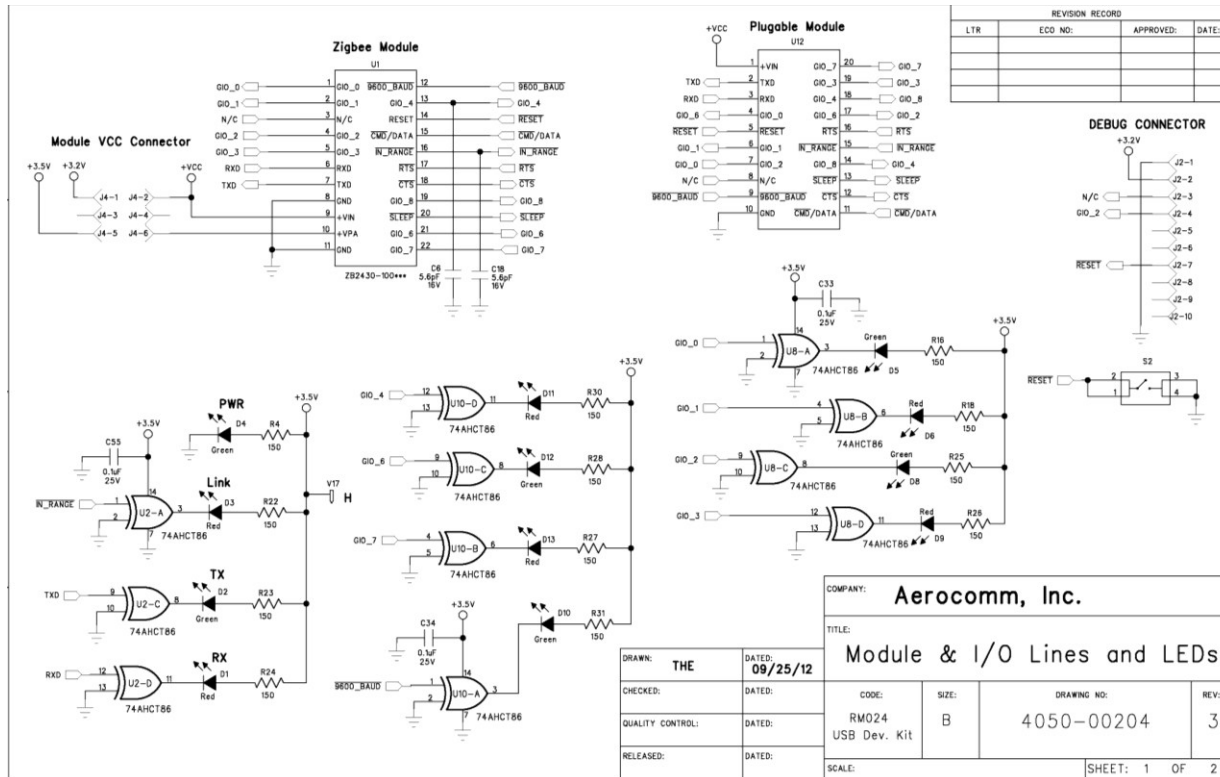


Figure 4: RM024 DVK Schematic - Module and I/O Lines and LEDs

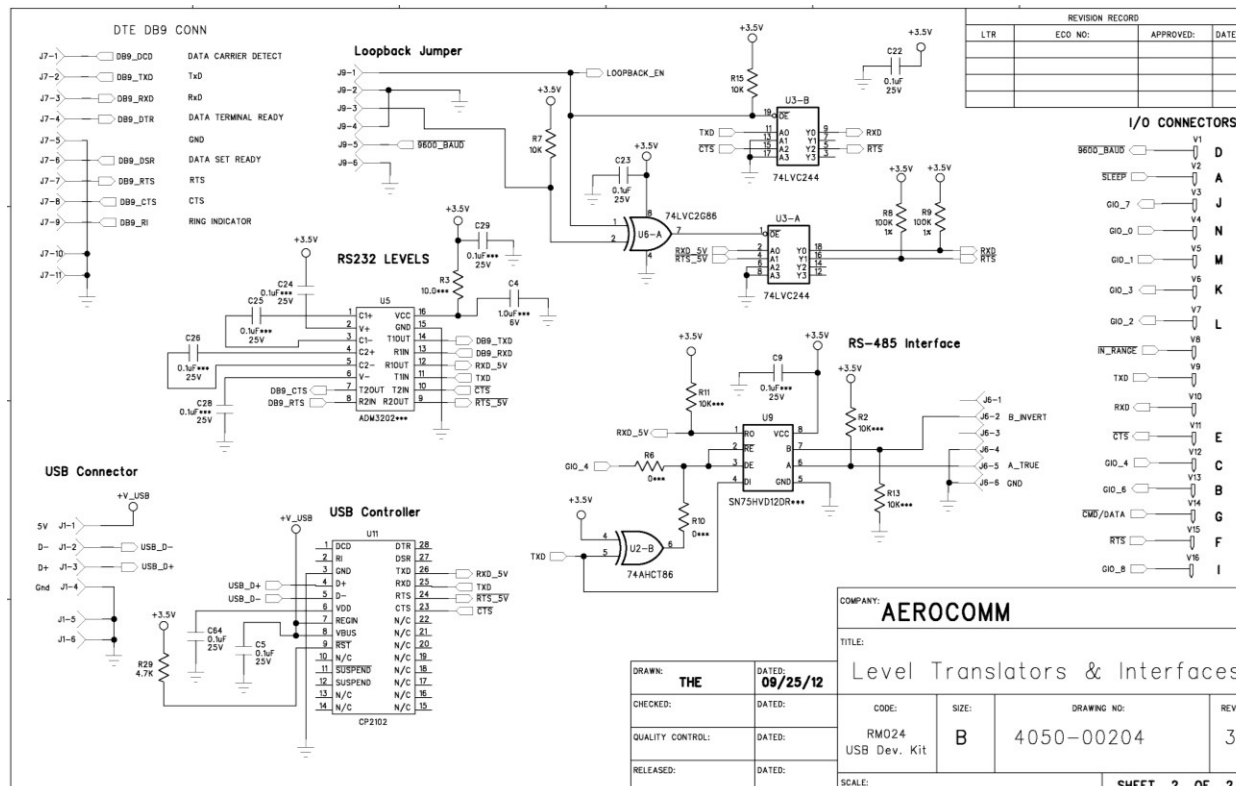


Figure 5: RM024 DVK Schematic - Level Translators and Interfaces

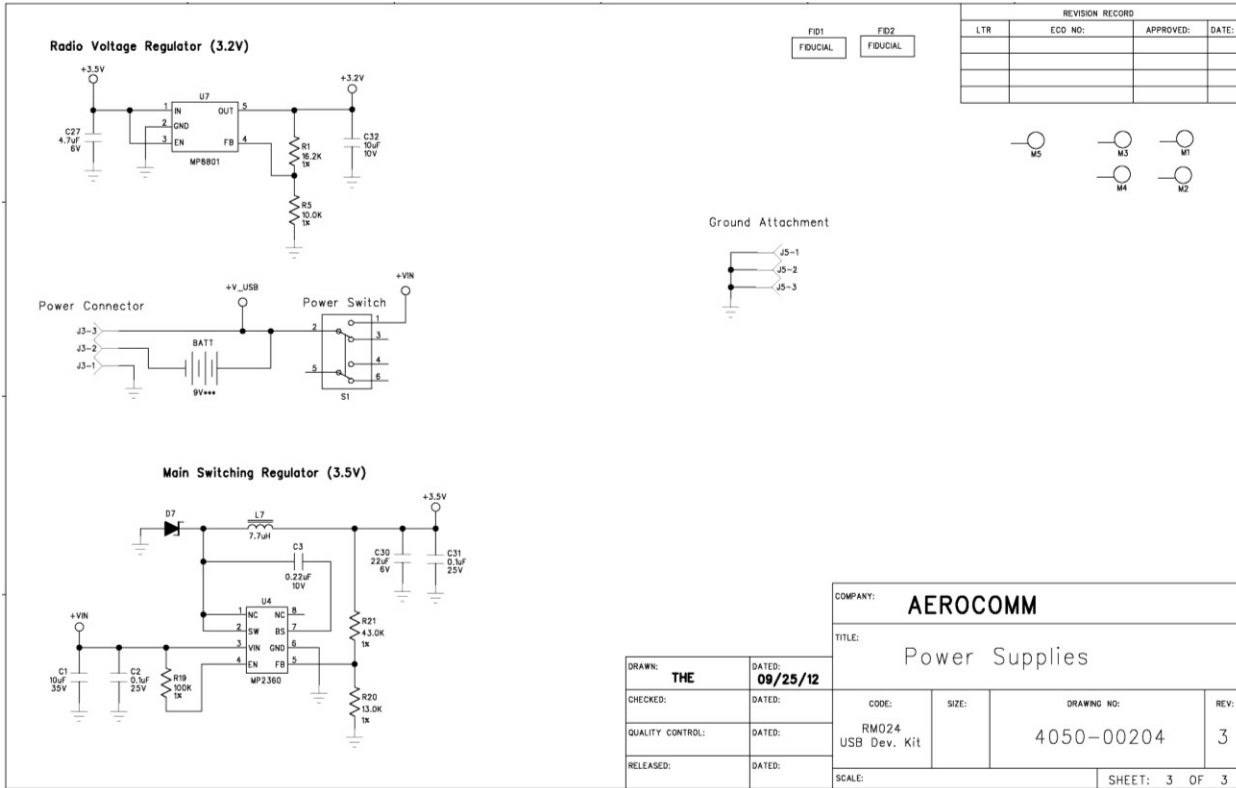


Figure 6: RM024 DVK Schematic - Power Supplies

3 Troubleshooting

Problem	Solution
No lights on DVK Board.	<ol style="list-style-type: none"> 1. Check the power connection. The VCC LED should be lit when power is applied to the serial board. 2. Make sure there is nothing shorting VCC to GND and that the radio is seated into its interconnect board properly. 3. Make sure that the Power switch is in the On Position.
Radio EEPROM cannot be read by Ezurio OEM.exe.	<ol style="list-style-type: none"> 1. Verify that power is applied and that the serial/USB cable is connected to the serial board and the PC. 2. Verify that the correct serial/USB port is selected in the software (Port 1 or Port 2). 3. Verify baud rate and port address on the PC Settings page. 4. Verify the Port Status is Open in the Status bar or in the Port 1 Settings on the PC Settings tab.
EEPROM can be read/viewed with the OEM software, but data cannot be sent between the two transceivers using OEM.exe.	<ol style="list-style-type: none"> 1. Reset both radios. 2. Make sure both transceivers have the same Channel Number and System ID 3. Check all cables and connections. 4. Make sure one radio is a server and one is a client. 5. Check radio addressing. 6. Make sure that radios are separated by at least ten feet. 7. Make sure the In Range LED is lit on both transceivers.
Packets can be sent between both radios using OEM.exe but cannot be sent from software or hardware not supplied by Ezurio	<ol style="list-style-type: none"> 1. Use the Hardware section of this guide to determine if a null-modem adapter is required for interfacing to the hardware. 2. Make sure the baud rate of the radios matches that of the OEM Host hardware.
A Framing or Data Timeout error occurs while running a Range Test.	<ol style="list-style-type: none"> 1. Verify that the baud rate on the PC Settings page matches that of the radio's EEPROM. 2. Verify that both radios are powered on and that the Port settings are correct. 3. Verify that the In Range LED is lit on both radios.

4 Technical Support

Please refer to the contact information included in the DVK for further details. For all other inquiries, please refer to the RM024 Quick Start Guide and RM024 User's Guides.

4.1 RM024 Basics and Tips

1. There must only be one server per network (RF Channel Number & System ID); there can be any number of clients.
2. The Default configuration is a client radio with the addressing mode not set. For the radios to communicate, the addressing must be set to either:
 - Broadcast Mode
 - Auto Destination (for clients only)
 - The MAC Address of the remote radio must be entered into the Destination Field.
3. The Link LED on the server is always lit. The Link LED on a client is lit when it is in sync with a server. The Link light must be lit for RF communications to occur.
4. Configuration should always be performed with the Ezurio Windows OEM Configuration Utility. Though the radios are serial modems accessible through traditional terminal emulators such as HyperTerminal, the AT commands must be sent in their entirety which cannot be achieved when typed in manually. Once configured, testing can be performed with HyperTerminal or another emulator to send serial data.
5. Windows only allows one program to access a Serial Communications Port at a time. When the Ezurio Windows OEM Configuration Utility is open, no other serial applications should be open.
6. When using the USB Evaluation Board, it is recommended to click **Close the Port** on the PC Settings tab prior to unplugging the USB cable or powering off the module. If not, the port may become unavailable and need to be either toggled by closing and opening the port, or the software may need to be reset.
7. The PC Settings tab is used to set the configuration of the OEM Configuration Utility, not the radio. The Configuration Tab is used to configure the radio, but the radio's EEPROM must be read first.

5 Additional Information

Please contact your local sales representative or our support team for further assistance:

Headquarters	Ezurio 50 S. Main St. Suite 1100 Akron, OH 44308 USA
Website	http://www.ezurio.com
Technical Support	http://www.ezurio.com/resources/support
Sales Contact	http://www.ezurio.com/contact

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